

CLAIMS

1. A catalyst comprising a composite complex made of one or more metal species having 10 to 50,000 atoms and an organic matter bonded to the metal species, the composite complex carried on a calcined porous carrier made of one or more metal oxides or carbon.
2. The catalyst according to claim 1, wherein the composite complex is reduced before or after calcining the carrier having carried the composite complex thereon.
3. The catalyst according to claim 1 or 2, wherein the composite complex is soluble in water.
4. The catalyst according to any one of claims 1 to 3, wherein the organic matter composing the composite complex has at least one of nitrogen, a carboxyl group, a carbonyl group and an alcohol group in the molecule.
5. The catalyst according to claim 4, wherein the organic matter composing a composite complex is polyacrylic acid, polymethacrylic acid, polyethyleneimine, polyallylamine, polyvinylpyrrolidone, polyvinyl alcohol, poly(N-carboxymethyl)ethyleneimine, poly(N,N-dicarboxymethyl)arylamine, or a copolymer containing one or more thereof.
6. The catalyst according to claim 4, wherein the organic matter is polyamino acid or polysaccharide.

7. The catalyst according to any one of claims 1 to 6, wherein the one or more metal ions are at least any ions of platinum, palladium, rhodium, ruthenium, silver, gold and iridium.
- 5 8. The catalyst according to any one of claims 1 to 7, wherein the porous carrier is any of ceria, ceria-zirconia, ceria-zirconia-yttria, alumina, silica, titania and zirconia.
9. The catalyst according to any one of claims 1 to 8, wherein the porous
10 carrier comprises at least one of aluminum, zirconium, silicon, titanium, lanthanum, cerium, neodymium and yttrium.
10. The catalyst according to any one of claims 1 to 9, further comprising
15 any of an alkali metal element, an alkaline earth metal element and a rare earth metal element carried thereon.
11. The catalyst according to claim 10, wherein the alkali metal element is lithium, sodium, potassium, rubidium or cesium.
- 20 12. The catalyst according to claim 10, wherein the alkaline earth metal element is magnesium, calcium, strontium or barium.
13. The catalyst according to claim 10, wherein the rare earth metal
25 element is lanthanum or cerium.
14. A method for producing a catalyst comprising the steps of:
producing a metal salt solution containing salts of one or more metals;

dispersing the metal salt solution, an organic matter and a porous carrier made of one or more metal oxides in a solvent to form a composite complex comprising one or more metal ions having 10 to 50,000 atoms and the organic matter bonded to the metal ions, and to simultaneously make the
5 composite complex carried on the porous carrier; and
calcining the carrier having the composite complex carried thereon.

15. The method for producing a catalyst according to claim 14, further comprising a step of reducing the metal ions on the porous carrier by
10 reducing the carrier after the step of making the composite complex carried on the carrier and before or after calcining the carrier, and then calcining the carrier after the reduction step.

16. The method for producing a catalyst according to claim 14 or 15,
15 wherein the organic matter has at least one of nitrogen, a carboxyl group, a carbonyl group and an alcohol group in the molecule.

17. The method for producing a catalyst according to claim 16, wherein the organic matter is polyacrylic acid, polymethacrylic acid, polyethyleneimine,
20 polyallylamine, polyvinylpyrrolidone, polyvinyl alcohol, poly(N-carboxymethyl)ethyleneimine, poly(N,N-dicarboxymethyl)arylamine, or a copolymer containing one or more thereof.

18. The method for producing a catalyst according to claim 16, wherein the
25 organic matter is polyamino acid or polysaccharide.